Saskatchewan
Agriculture
and Food

FINAL REPORT

Agriculture Research Branch
Saskatchewan Agriculture, Food & Rural Revitalization

20010361

MOLECULAR MARKER ASSISTED SELECTION, "CDC"
FINAL REPORT

Funded by
Technology Adoption Demonstration

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Final Report on the TAD Funded Project
Molecular Marker-assisted Selection – CDC

Project # 20010361 Res. TAD 3

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March, 2004

Abstract:
Laboratory equipment was acquired and some existing equipment was refurbished/modified to equip the Molecular Marker Assisted Selection (MMAS) laboratory in the Department of Plant Sciences/Crop Development Centre. This equipment will be used in conjunction with other equipment purchased through CFI grants to Drs. T. Warkentin (Crop Development Centre) and Dr. Kirstin Bett (Department of Plant Sciences) to provide molecular marker assisted selection support to the Crop Development Centre plant breeding programs. MMAS projects have been initiated in collaboration with a number of plant breeders in the Department of Plant

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Executive Summary:

Laboratory equipment was acquired and some existing equipment was refurbished/modified to equip the Molecular Marker Assisted Selection (MMAS) laboratory in the Department of Plant Sciences/Crop Development Centre. This equipment will be used in conjunction with other equipment purchased through CFI grants to Drs. T. Warkentin (Crop Development Centre) and Dr. Kirstin Bett (Department of Plant Sciences) to provide molecular marker assisted selection support to the Crop Development Centre plant breeding programs. MMAS projects have been initiated in collaboration with a number of plant breeders in the Department of Plant Sciences/Crop Development Centre. These are expected to increase the efficiency of selection for desirable disease resistance, quality and agronomic traits resulting in the development of improved crop varieties for Saskatchewan crop producers.

Projects initiated to date include:

- Development of high throughput screening methods for marker-assisted selection in various crop species. Developing protocol to use BioMek robot (CFI grant to T. Warkentin in 2000) to do repetitive tasks involved in extracting DNA and setting up PCR reactions. Collaborators: Drs. T. Warkentin (pea, chickpea), B. Vandenberg (bean, lentil), C. Pozniak (durum and CPS wheat). All three are Crop Development Centre scientists.

- Optimization of protocol for screening markers for common bacterial blight resistance for CDC dry bean breeding program. Collaborator, Dr. B. Vandenberg, Crop Development Centre.

- Fingerprinting of sour cherry breeding lines. Collaborator, Dr. B. Bors, Department of Plant Sciences.

- Screening of markers on a chickpea mapping population to develop a map of the genome. Collaborators, Drs. T. Warkentin and B. Tar'an, Crop Development Centre.

- Development of dry bean mapping populations segregating for quality traits.

Collaborator, Dr. B. Vandenberg, Crop Development Centre.

- Optimization of protocol for screening markers for reduced cadmium uptake for CDC durum breeding program. Collaborator, Dr. C. Pozniak, Crop Development Centre

These projects are all in early stages and so results are not available at this time.

Technical Report:

Objective:

To enhance research infrastructure in the Crop Development Centre for Molecular Marker Assisted Selection (MMAS) support for plant breeding in the Crop Development Centre.

The following laboratory equipment was purchased or modified to meet the needs of the program:

- **Liquid handling instruments ($22K)**
  - pipettors for dispensing various amounts of liquids from 0.5 ul to 5 ml (some new and some repaired and recaliberated)
  - multichannel pipettors to increase the efficiency of screening
  - repeat pipettors to increase efficiency of extractions
  - modifications to the BioMek liquid handling robot to allow for high-throughput DNA extraction and PCR set-up
  - share of BioMek warranty

- **Centrifuge and accessories ($13K)**
  - for genomic DNA, RNA and protein extractions

- **Storage facilities ($18K)**
  - Ultra-low temperature freezer for long-term storage of critical samples, probes and enzymes
  - Explosion-proof -20C freezer for short-term storage of samples and reagents
  - 30L Dewar for storage of liquid nitrogen

- **Gel rigs and accessories ($15K)**
  - sequencing gel rigs for polyacrylamide gel electrophoresis
  - power packs for above
  - various combs for gel formation

- **Thermal cycler ($16K)**
  - to run PCR reactions

- **Growth facilities ($14K)**
  - cabinets for germination of large numbers of seedlings for screening

  - controllers for flood benches with automatic watering for development of mapping populations
- **Other lab equipment ($3K)**
  - ergonomic lab stools
  - hot plates, stir plates, heat blocks for sample preparation
  - pH meters for reagent preparation

Related equipment acquired through other sources:
A CFI grant of $120K to K. Bett provided the following equipment in addition to that described above:

- 2 thermal cyclers
- second ultra-low freezer
- extra centrifuge
- spectrophotometer
- gel documentation system
- bioinformatics system

Projects being carried out:

- Development of high throughput screening methods for marker-assisted selection in various crop species. Developing protocol to use BioMek robot (CFI grant to T. Warkentin in 2000) to do repetitive tasks involved in extracting DNA and setting up PCR reactions.
  Collaborators:
  - Drs. T. Warkentin (pea, chickpea), B. Vandenberg (bean, lentil), C. Pozniak (durum wheat). All three are Crop Development Centre scientists.

- Optimization of protocol for screening markers for common bacterial blight resistance for CDC dry bean breeding program.
  Collaborator:
  - Dr. B. Vandenberg, Crop Development Centre.

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- Optimization of protocol for screening markers for reduced cadmium uptake for CDC durum breeding program.
  Collaborator:
  - Dr. C. Pozniak, Crop Development Centre

Personnel:
The objective of the grant was to provide laboratory equipment. Thus, these funds were not used to hire personnel.

Equipment Purchased:
The equipment purchased with these funds is described above.

Project Developed Materials:
These funds were used to provide equipment for a new program. Projects that have been initiated to date are listed above in the Technical Report section. These projects are in preliminary stages and there are no project developed materials at this stage.

Project Photos:
None.

Acknowledgement:
Support from the Government of Saskatchewan will be acknowledged in all presentations, posters and publications.